# INA280A/B(LX)
# 2.7V to 120V, 1.1MHz, High Precision High-side Current Sense Amplifier

# Product Specification



**Specification Revision History：**

| Version | Date | Description |
|---|---|---|
| 2024-08-A0 | 2024-08 | New |
| 2025-12-A1 | 2025-12 | Modify the parameters |
| | | |
| | | |

# Contents

## 1、General Description

The INA280A/B is a high-side current sense amplifier, which operates from a single 2.7V to 30V supply and can measure voltage drops across shunt resistors over a wide common-mode range from 2.7 V to 120 V.

The INA280A/B has five gain options: 20V/V, 50V/V, 100V/V, 200V/V, and 500V/V. The current measurement accuracy is achieved thanks to the combination of an ultra-low offset voltage of ±150μV, a small gain error of ±0.5%, and a high DC CMRR of 140dB. The INA280A/B is not only designed for DC current measurement, but also for high-speed applications with a high bandwidth of 1.1MHz (at gain of 20V/V).

The INA280A/B enables accurate current sensing over the extended operating temperature range of -40℃ to +125℃. Under typical conditions, the device draws a 350μA supply current.

**Features:**

- Common-mode voltage:
  2.7V to 120V
- Accuracy
  Gain:
  • Gain error: ±0.5% (max.)
  • Gain drift: ±20 ppm/℃ (max.)
  Offset:
  • Offset voltage: ±150μV (max.)
  • Offset drift: ±1μV/℃ (max.)
- CMRR:
  120-dB DC (Min.)
  72-dB AC at 50 kHz
- High bandwidth: 1.1 MHz
- Available gains:
  INA280A1/B1: 20V/V
  INA280A2/B1: 50V/V
  INA280A3/B1: 100V/V
  INA280A4/B1: 200V/V
  INA280A5/B1: 500V/V
- Quiescent current: 350μA (typ.)
- Temperature range: -40℃ to 125℃
- Package information: SOT353,SOT23-5
- ESD level: 6KV- HBM

**Ordering Information:**

**Reel packing specifications:**

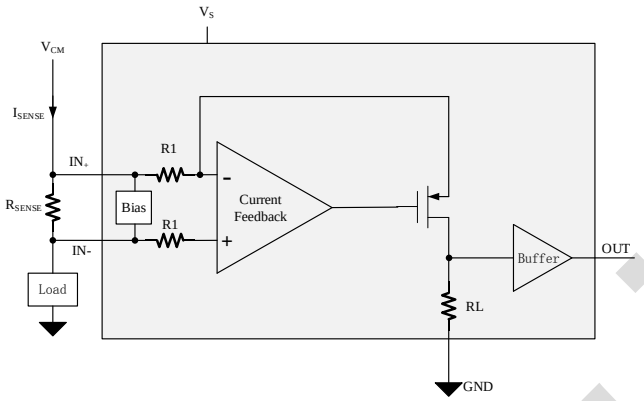
| Part number | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes |
|---|---|---|---|---|---|
| INA280A1IDCKR(LX) | SOT353 | JCXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm |
| INA280A2IDCKR(LX) | SOT353 | JDXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm |
| INA280A3IDCKR(LX) | SOT353 | JEXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm |
| INA280A4IDCKR(LX) | SOT353 | JFXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm |
| INA280A5IDCKR(LX) | SOT353 | JGXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm |
| INA280A1IDBVR(LX) | SOT23-5 | JCXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280A2IDBVR(LX) | SOT23-5 | JDXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280A3IDBVR(LX) | SOT23-5 | JEXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280A4IDBVR(LX) | SOT23-5 | JFXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280A5IDBVR(LX) | SOT23-5 | JGXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |

| | | | | | |
|---|---|---|---|---|---|
| INA280B1IDBVR(LX) | SOT23-5 | KLXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280B2IDBVR(LX) | SOT23-5 | KMXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280B3IDBVR(LX) | SOT23-5 | KNXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280B4IDBVR(LX) | SOT23-5 | KPXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |
| INA280B5IDBVR(LX) | SOT23-5 | KQXX | 3000 PCS/reel | 30000 PCS/box | Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm |

Note 1: “XX” refers to variable content, meaning year and package batch serial number.
Note 2: If the physical information is inconsistent with the ordering information, please refer to the actual product.

## 2、Block Diagram And Pin Description

### 2.1、Block Diagram

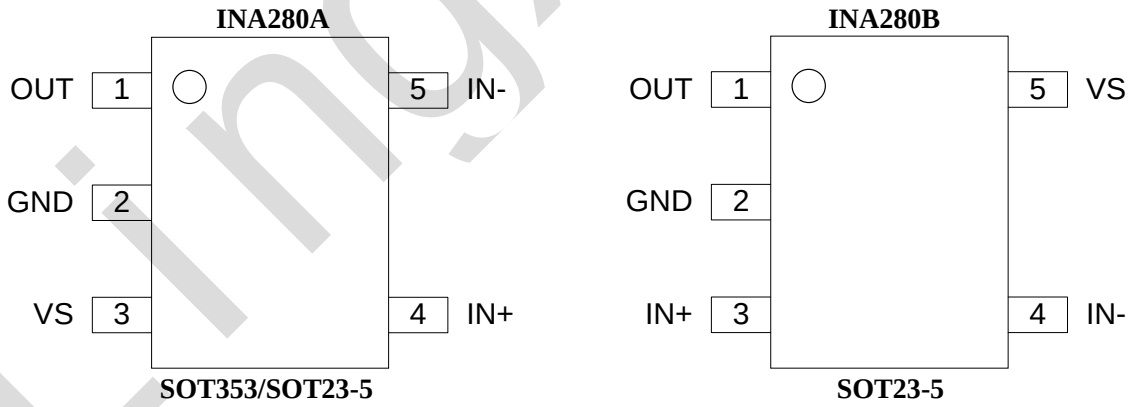



INA280A/B Type List

| Product | Gain | R1 | RL |
|---|---|---|---|
| INA280A1/B1 | 20 | 25K | 500K |
| INA280A2/B2 | 50 | 10K | 500K |
| INA280A3/B3 | 100 | 10K | 1M |
| INA280A4/B4 | 200 | 5K | 1M |
| INA280A5/B5 | 500 | 2K | 1M |

$$OUT = \frac{R_L}{R_1}(I_{SENSE} * R_{SENSE})$$

### 2.2、Pin Configurations



### 2.3、Pin Description

| Pin No. | | Pin Name | IO | Description |
|---|---|---|---|---|
| INA280A | INA280B | | | |
| 1 | 1 | OUT | O | Output voltage |
| 2 | 2 | GND | Ground | Ground |
| 3 | 5 | VS | Power | Power supply |
| 4 | 3 | IN+ | I | Connect to supply side of shunt resistor |
| 5 | 4 | IN- | I | Connect to load side of shunt resistor |

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

($T_{amb}$=25℃, unless otherwise specified)

| Characteristic | Symbol | Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_S$ | - | -0.3 | 33 | V |
| Input Voltage | $V_{IN+}$,$V_{IN-}$ | $V_{IN+}$-$V_{IN-}$ | -30 | 30 | V |
| | | ($V_{IN+}$+$V_{IN-}$)/2 | -17 | 122 | V |
| Ambient Temperature | $T_{amb}$ | - | -40 | 125 | ℃ |
| Storage Temperature | $T_{stg}$ | - | -65 | 150 | ℃ |
| ESD Level | HBM | - | - | ±6 | kV |
| Soldering Temperature | $T_L$ | 10s | 260 | | ℃ |

### 3.2、Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Common-Mode Input Voltage | $V_{CM}$ | $V_S$ | 48 | 120 | V |
| Supply Voltage | Vs | 2.7 | 5 | 30 | V |

### 3.3、Electrical Characteristics

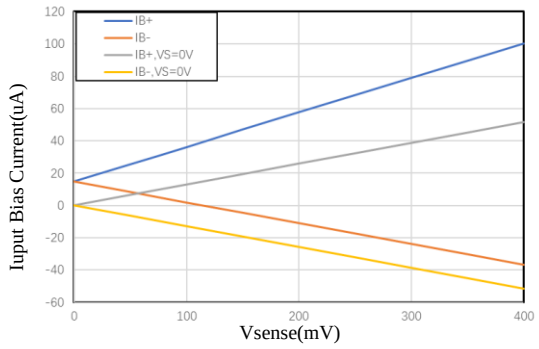
($T_{amb}$=25℃, $V_S$=5V, $V_{SENSE}$=$V_{IN+}$ – $V_{IN–}$=0.5V/Gain, $V_{CM}$=$V_{IN–}$=48V, unless otherwise specified)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Input** | | | | | | |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$=2.7V to 120V, $T_{amb}$=-40℃ to +125℃ | 120 | 140 | - | dB |
| | | f=50kHz | - | 72 | - | dB |
| Offset Voltage, Input Referred | $V_{OS}$ | - | - | 15 | ±150 | μV |
| Offset Voltage Drift | $dV_{OS}/dT$ | $T_{amb}$=-40℃ to +125℃ | - | - | 1 | μV/℃ |
| Power Supply Rejection Ratio, Input Refered | PSRR | $V_S$=2.7V to 20V, $T_{amb}$=-40℃ to +125℃ | - | 1 | ±10 | μV/V |
| Input Bias Current | $I_B$ | $I_{B+}$, $V_{SENSE}$=0mV | 10 | 15 | 25 | μA |
| | | $I_{B-}$, $V_{SENSE}$=0mV | 10 | 15 | 25 | μA |
| **Output** | | | | | | |
| Gain | G | INA280A1/B1 | - | 20 | - | V/V |
| | | INA280A2/B2 | - | 50 | - | |

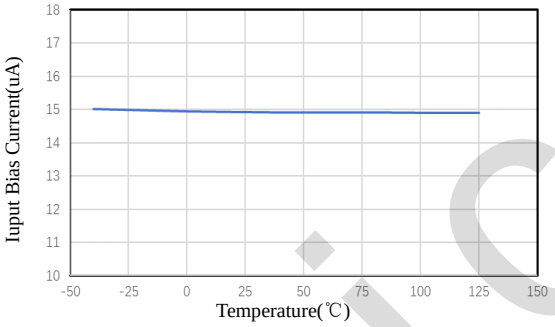
| | | | | | | |
|---|---|---|---|---|---|---|
| | | INA280A3/B3 | - | 100 | - | |
| | | INA280A4/B4 | - | 200 | - | |
| | | INA280A5/B5 | - | 500 | - | |
| Gain Error | $E_G$ | GND+50mV≤$V_{OUT}$≤$V_S$-200mV | - | 0.1 | ±0.5 | % |
| Gain Error Temperature Drift | $E_G$ TC | $T_{amb}$=-40℃ to +125℃ | - | 2.5 | 20 | ppm/℃ |
| Nonlinearity error | - | - | - | 0.01 | - | % |
| Maximum Capacitor Load | $C_{LOAD}$ | No sustained oscillations, no isolation resistor | - | 500 | - | pF |
| **Voltage Output** | | | | | | |
| Output Swing from Power Rail | $V_{OH}$ | $R_{LOAD}$=10kΩ, -40℃ to +125℃ | - | $V_S$-0.07 | $V_S$-0.2 | V |
| Output Swing from Ground Rail | $V_{OL}$ | $R_{LOAD}$=10kΩ, $V_{SENSE}$=0V, -40℃ to +125℃ | - | 0.005 | 0.025 | V |
| **Frequency Response** | | | | | | |
| Bandwidth | BW | INA280A1/B1, $C_{LOAD}$=5pF, $V_{SENSE}$=200mV | - | 1100 | - | kHz |
| | | INA280A2/B2, $C_{LOAD}$=5pF, $V_{SENSE}$=80mV | - | 1100 | - | |
| | | INA280A3/B3, $C_{LOAD}$=5pF, $V_{SENSE}$=40mV | - | 900 | - | |
| | | INA280A4/B4, $C_{LOAD}$=5pF, $V_{SENSE}$=20mV | - | 850 | - | |
| | | INA280A5/B5, $C_{LOAD}$=5pF, $V_{SENSE}$=8mV | - | 800 | - | |
| Swing Rate | SR | - | - | 2.4 | - | V/μs |
| Settling Time | | $V_{OUT}$=4V ±0.1V step, output settles to 0.5% | - | 9 | - | μs |
| | | $V_{OUT}$=4V ±0.1V step, output settles to 1% | - | 5 | - | |
| **Noise RTI** | | | | | | |
| Voltage noise density | $Ve_n$ | f =1 kHz | - | 50 | - | nV /√Hz |
| **Power Supply** | | | | | | |
| Power Supply Voltage | $V_S$ | $T_{amb}$=-40℃ to +125℃ | 2.7 | - | 30 | V |
| Quiescent Current | $I_Q$ | - | - | 350 | 500 | μA |
| | | $T_{amb}$=-40℃ to +125℃ | - | - | 600 | |

## 4、Characteristic Curve

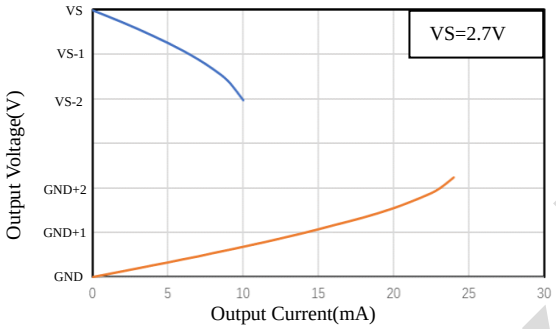
($T_{amb}$=25℃, $V_S$=5V, $V_{SENSE}=V_{IN+}-V_{IN-}$=0.5V/Gain, $V_{CM}=V_{IN-}$=48V, unless otherwise specified)



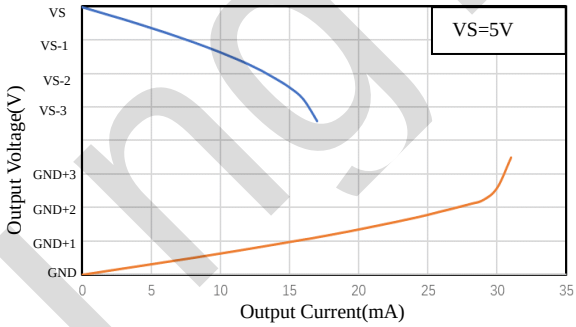

**Input Bias Current vs Vsense, A3 devices**



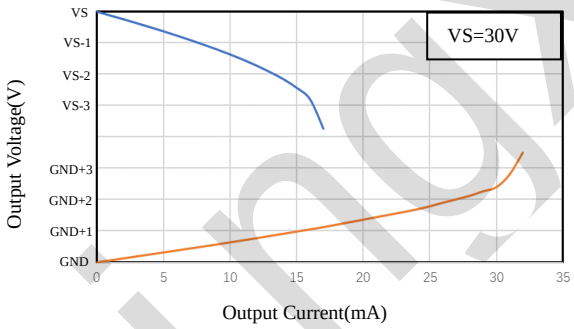

**Input Bias Current vs Temperature**



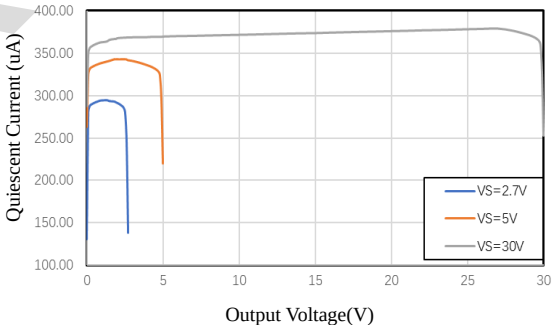

**Output Voltage vs Output Current**



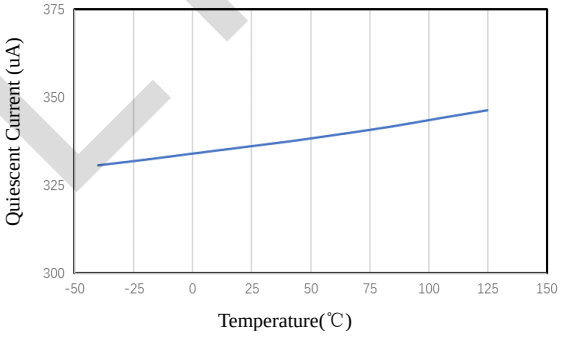

**Output Voltage vs Output Current**



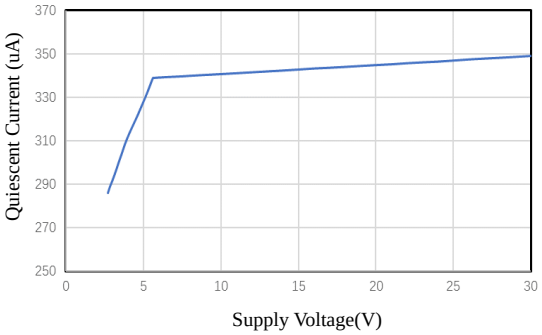

**Output Voltage vs Output Current**



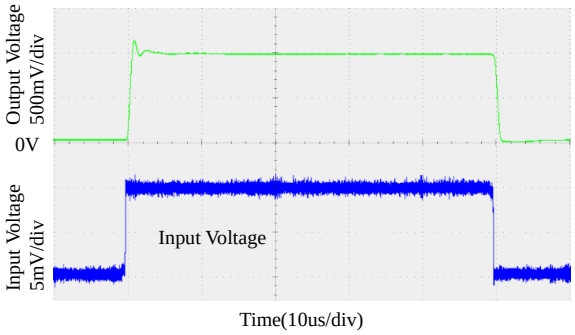

**Quiescent Current vs Output Voltage**



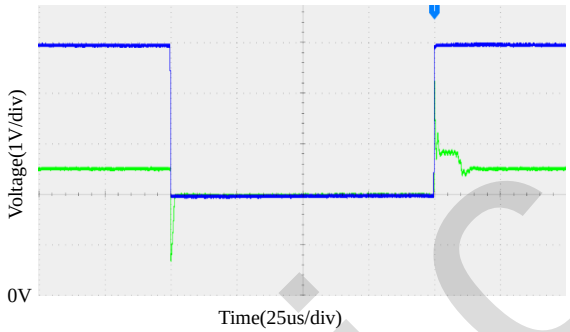

**Quiescent Current vs Temperature**




**Quiescent Current vs Supply Voltage**




**Step Response,A3 devices**



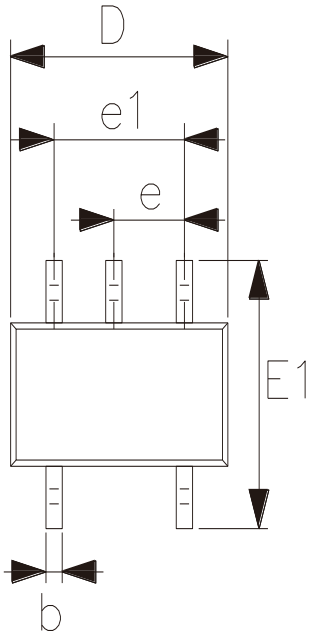

**Supply Transient Response,A3 devices**

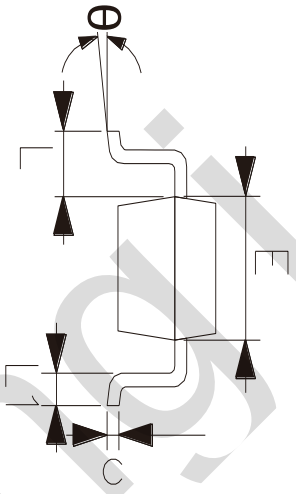
## 5、Power Supply Recommendations

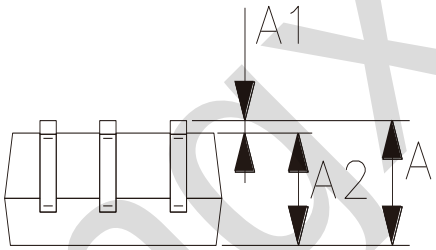
The input circuitry of the INA280A/B device can accurately measure beyond the power-supply voltage. The power supply can be 30 V, whereas the load power-supply voltage at IN+ and IN- can go up to 120V. The output voltage range of the OUT pin is limited by the voltage on the VS pin and the device swing to supply specification.

# 6、Package Information

## 6.1、SOT353

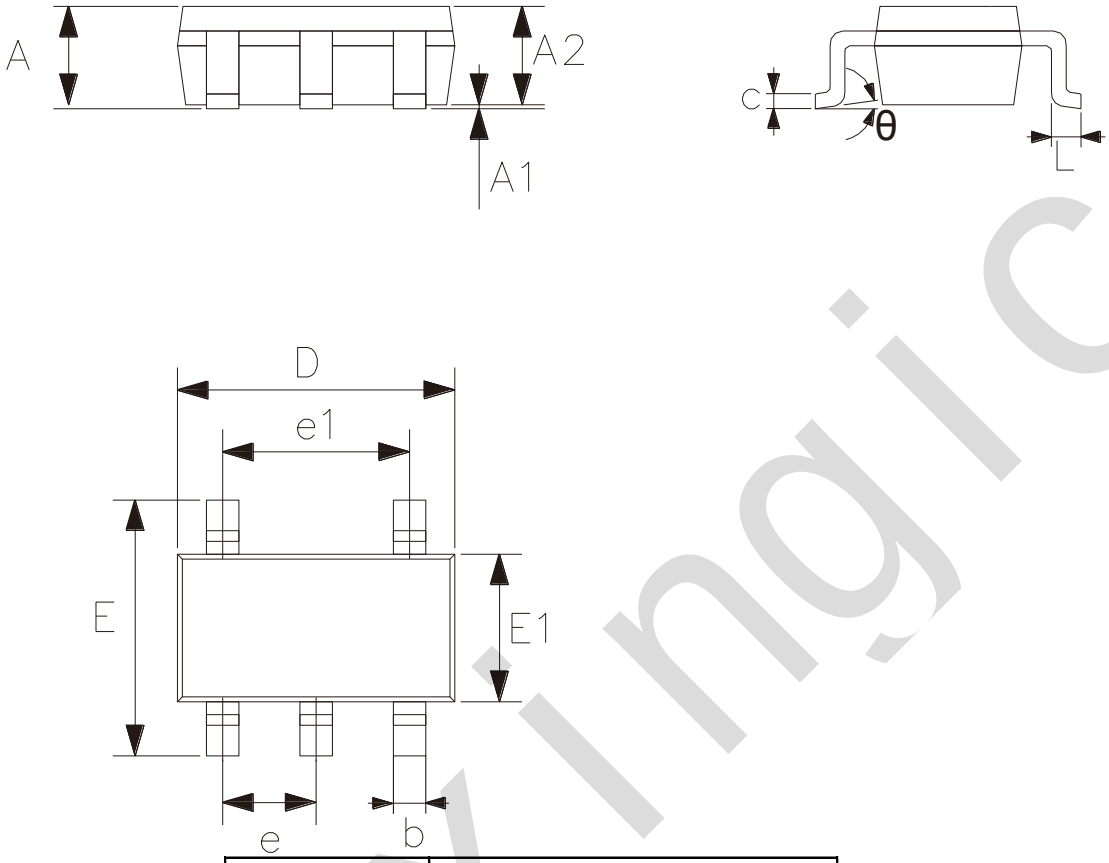



| 2023/12/A | Dimensions In Millimeters | |
|---|---|---|
| Symbol | Min. | Max. |
| A | 0.90 | 1.10 |
| A1 | 0.00 | 0.10 |
| A2 | 0.90 | 1.00 |
| b | 0.15 | 0.35 |
| c | 0.11 | 0.175 |
| D | 2.00 | 2.20 |
| E | 1.15 | 1.35 |
| E1 | 2.15 | 2.45 |
| e | 0.65 | |
| e1 | 1.20 | 1.40 |
| L | 0.525 | |
| L1 | 0.26 | 0.46 |
| θ | 0° | 8° |

**6.1、SOT23-5**




| 2023/12/A | Dimensions In Millimeters | |
|---|---|---|
| Symbol | Min. | Max. |
| A | — | 1.26 |
| A1 | 0.00 | 0.12 |
| A2 | 1.00 | 1.20 |
| b | 0.30 | 0.50 |
| c | 0.10 | 0.20 |
| D | 2.82 | 3.02 |
| E | 2.60 | 3.00 |
| E1 | 1.50 | 1.70 |
| e | 0.95 | |
| e1 | 1.80 | 2.00 |
| L | 0.30 | 0.60 |
| θ | 0° | 8° |

# 7、Statements And Notes

## 7.1、The name and content of Hazardous substances or Elements in the product

| Part name | Hazardous substances or Elements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lead and lead compounds | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic resin | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The lead | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic sheet installed | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| explanation | ○：Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.<br>×：Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements. | | | | | | | | | |

## 7.2、Notes

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